

Species Status Assessment

Class: Bird
Family: Emberizidae
Scientific Name: *Ammodramus caudacutus*
Common Name: Saltmarsh sparrow

Species synopsis:

The sharp-tailed sparrow group was split in 1995 to recognize two distinct species: saltmarsh sharp-tailed sparrow (*Ammodramus caudacutus*) and Nelson's sharp-tailed sparrow (*A. nelsoni*). "Sharp-tailed" was subsequently dropped from each common name (AOU 2009). The two species replace each other geographically with saltmarsh sparrow breeding and wintering along the Atlantic Coast and Nelson's sparrow occurring in the Canadian Great Plains, Hudson and James bays, and the northern Atlantic Coast. There is overlap of the two species from Maine to Massachusetts and it has been suggested that this hybridization zone is expanding southward (Hodgman et al. 2002).

As its name implies, saltmarsh sparrow is an obligate species of brackish and salt marshes. Available data on population trends for saltmarsh sparrow suggest that loss of coastal marsh habitat over the past 100 years has resulted in population reductions and local extirpations (DiQuinzio et al. 2001). New York's Breeding Bird Atlas in 1980-85 (Lent 1988) provided the first comprehensive evaluation of the species in New York (Greenlaw 2008). During that period, breeding was confirmed only in the salt marshes of the Coastal Lowlands with a concentration on the South Shore of Long Island. The second Atlas in 2000-05 documented this sparrow in nearly the same distribution, though in 15% fewer survey blocks.

I. Status

a. Current and Legal Protected Status

i. **Federal** Not Listed **Candidate?** No

ii. **New York** Not Listed; SGCN

b. Natural Heritage Program Rank

i. **Global** G4

ii. **New York** S3B **Tracked by NYNHP?** No

Other Rank:

NYNHP – Watch List

Audubon - WatchList

Partners in Flight – Tier I (In need of immediate action)

IUCN – Vulnerable

USFWS – Species of Conservation Concern

New Hampshire – Special Concern, SGCN

Species of Northeast Regional Conservation Concern (Therres 1999)

Status Discussion:

The global population of saltmarsh sparrow exists in tidal habitats extending narrowly along the Atlantic Coast from Maine to Virginia; it is estimated that half of the population breeds in southern New England (Dettmers and Rosenberg 2000). The global population is estimated at 250,000 birds.

In New York, saltmarsh sparrow is a common to abundant localized breeder, restricted to Long Island. It is present on Long Island during the winter as well, though it becomes less common.

II. Abundance and Distribution Trends

a. North America

i. Abundance

 X declining ___increasing ___stable ___ unknown

ii. Distribution:

 X declining ___increasing ___stable ___ unknown

Time frame considered: 1995 to present

b. Regional

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Regional Unit Considered: Northeast

Time Frame Considered: 1995 to present

c. Adjacent States and Provinces

CONNECTICUT Not Present No data

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Time frame considered: 2000-2010

Listing Status: Special Concern SGCN? Yes

MASSACHUSETTS Not Present No data

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Time frame considered: 1974-79 to 2007-11

Listing Status: Not Listed SGCN? Yes

NEW JERSEY **Not Present** _____ **No data** _____

i. Abundance

 X declining ___increasing ___stable ___ unknown

ii. Distribution:

 X declining ___increasing ___stable ___ unknown

Time frame considered: _____

Listing Status: _____ Not Listed _____ SGCN? Yes

ONTARIO **Not Present** X **No data** _____

PENNSYLVANIA **Not Present** X **No data** _____

QUEBEC **Not Present** X **No data** _____

VERMONT **Not Present** X **No data** _____

d. NEW YORK **No data** _____

i. Abundance

 X declining ___increasing ___stable ___ unknown

ii. Distribution:

 X declining ___increasing ___stable ___ unknown

Time frame considered: 1980-85 to 2000-05

Monitoring in New York.

The Saltmarsh Habitat and Avian Research Program (SHARP) monitors populations of tidal marsh birds and the health of tidal habitats in the New England and Mid-Atlantic states. Saltmarsh sparrow is one of the focus species being monitored at 89 sites on Long Island.

A demographic study of this species is being conducted by a graduate student at State University of New York College of Environmental Science and Forestry (ESF) through a Memorandum of Understanding with DEC. This study replicates the demographic studies conducted by SHARP at four other sites along the Atlantic Coast. The goal of the study is to understand the potential for climate change and human development to affect salt marsh bird populations, with emphasis on the Saltmarsh Sparrow.

Additionally, Biodiversity Research Institute (BRI) has been conducting mercury exposure monitoring, food web and demographic studies of saltmarsh sparrows on Long Island, NY.

Trends Discussion:

Christmas Bird Count data from 1997 to 2005 record significant fluctuations in saltmarsh sparrow populations in the Northeast. Breeding Bird Survey data are too few to provide significant trends. Current and future population declines are based primarily on significant losses of saltmarsh habitat along the eastern coastline over the past 100 years and this bird's dependence upon that habitat.

Trend information for this species is unreliable because it is difficult to monitor; marsh habitat is often inaccessible and vocalizations are quiet. Also, because birds are not territorial and the sex ratio is uncertain, it is difficult to extrapolate population sizes from singing males (Greenlaw and Rising 1994). However, a decline of the species' critical habitat infers a population decline, and the literature indicates historically higher populations (Cruikshank 1942, Elliott 1962).

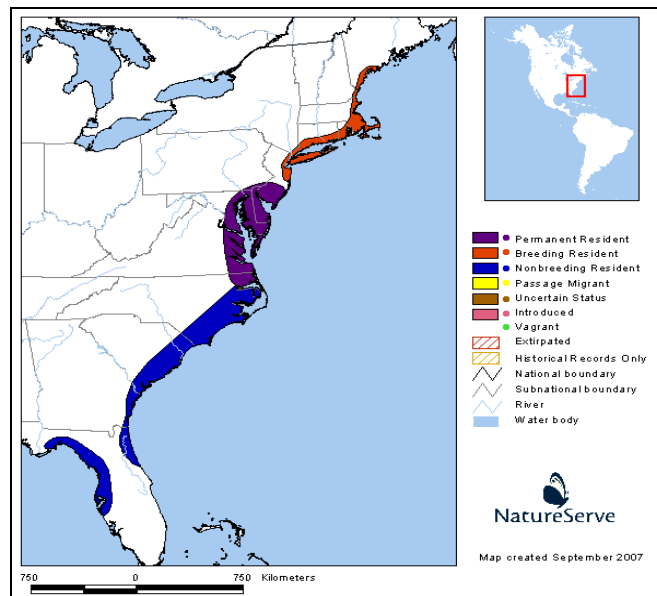


Figure 1. Distribution of saltmarsh sparrow in North America (NatureServe 2013).

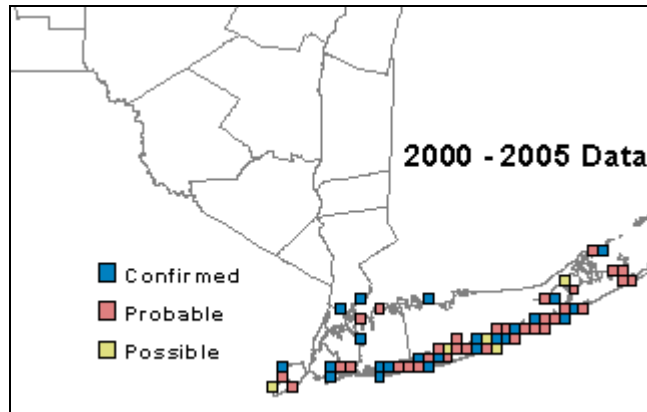


Figure 2. Saltmarsh sparrow occurrence in New York State during the second Breeding Bird Atlas (McGowan and Corwin 2008).

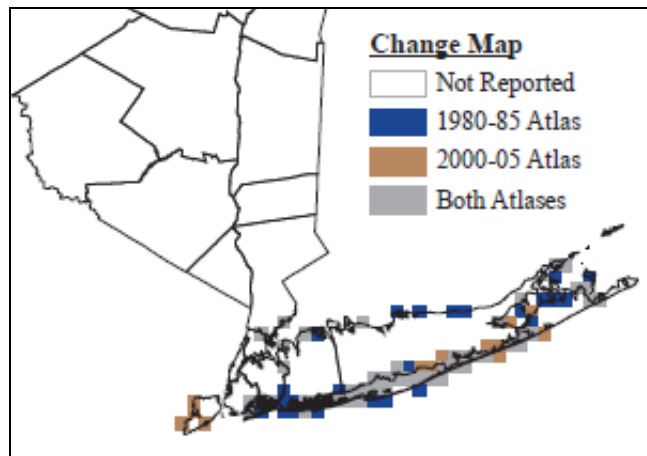


Figure 3. Change in saltmarsh sparrow occurrence in New York State between the first Breeding Bird Atlas and the second Breeding Bird Atlas (McGowan and Corwin 2008).

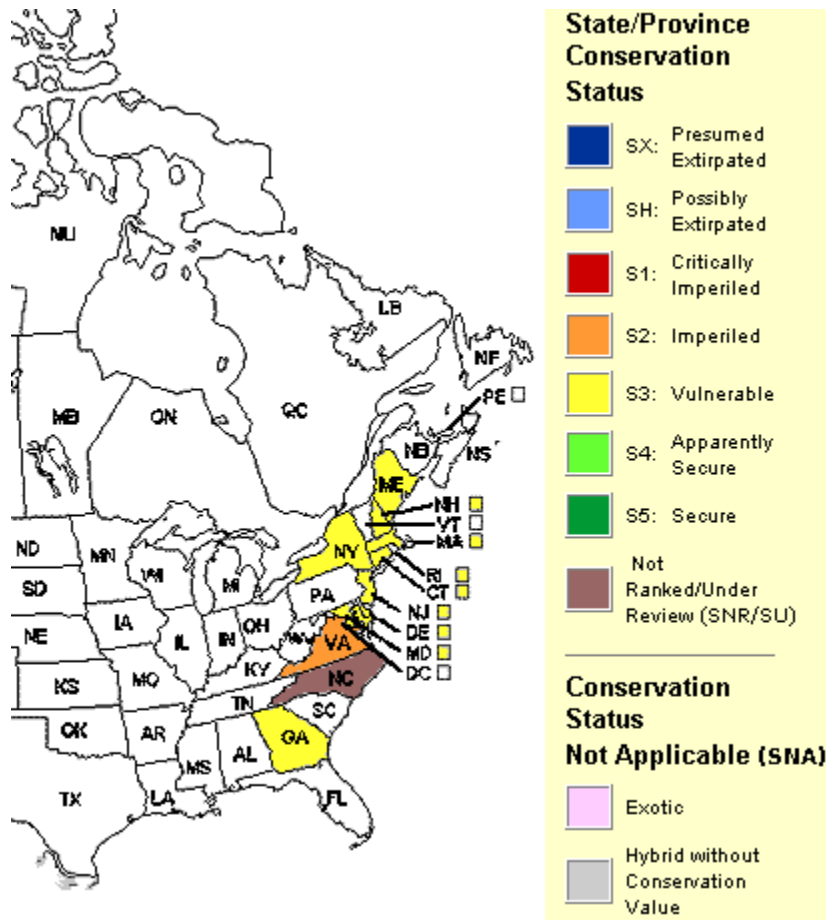


Figure 4. Conservation status of saltmarsh sparrow occurrence in North America (NatureServe 2012).

III. New York Rarity, if known:

Historic	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
prior to 1970	_____	_____	_____
prior to 1980	_____	_____	_____
prior to 1990	_____	_____	<u>1%</u>

Details of historic occurrence:

Two notable historic sites are discussed in Lent (1988): a colony of more than 200 birds in a marsh adjacent to Jamaica Bay was lost when the marsh was filled to build the JFK International Airport (Elliot 1962); a colony at Piermont Marsh, “30 miles up the Hudson River from the Narrows” was apparently extirpated due to pollution around 1930 (Hill 1968).

The first Breeding Bird Atlas (1980-85) documented occupancy in 72 survey blocks statewide. Breeding was confirmed in 53% of the blocks. Prior to the first Breeding Bird Atlas, this sparrow was found on Staten Island and inland at Piermont Marsh. During the Atlas period, however, it was found only on Long Island, primarily along the South Shore.

Current	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
	_____	_____	<u>1%</u>

Details of current occurrence:

The second Breeding Bird Atlas (2000-05) documented occupancy in 61 survey blocks statewide. Breeding was confirmed in 49% of the blocks. The statewide occupancy changed by 15% but this sparrow’s modern range in New York as documented by the first Atlas remained the same. The exception is the return of nesting on Staten Island, where the species was apparently absent for 30 years (Schiff and Wollin 1992).

New York's Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
<input checked="" type="checkbox"/> 0-5%	<input checked="" type="checkbox"/> Core
<input type="checkbox"/> 6-10%	<input type="checkbox"/> Peripheral
<input type="checkbox"/> 11-25%	<input type="checkbox"/> Disjunct
<input type="checkbox"/> 26-50%	Distance to core population:
<input type="checkbox"/> >50%	_____

IV. Primary Habitat or Community Type:

1. Estuarine, Brackish Intertidal, Tidal Wetland, High Marsh
2. Estuarine Intertidal, Brackish Meadow
3. Estuarine Intertidal, Salt Shrub

Habitat or Community Type Trend in New York:

Declining Stable Increasing Unknown

Time frame of decline/increase: Last 75+ years

Habitat Specialist? Yes No

Indicator Species? Yes No

Habitat Discussion:

The saltmarsh sparrow nests exclusively in estuarine emergent wetlands. In the Northeast the saltmarsh sparrow is found in salt marsh/meadows from just below to well above the mean high water level (Pierson et al. 1996). Successful nesting may be limited to areas above spring high tides, although nesting and fledging may be accomplished between spring tide events (Hill 1968).

In New York, this sparrow occurs in high salt marsh characterized by salt-meadow grass and spikegrass (see Lent 1988). Saltmarsh sparrows appear to be area-sensitive and are therefore unlikely to use small marshes (Benoit and Askins 2002). Elliot (1953) suggested that marshes

smaller than 0.4 to 0.8 ha are avoided although examples of sparrows using these small marshes do exist (e.g., Four Sparrow Marsh, New York City Parks, Brooklyn, NY). This may be due to the species' avoidance of marshes with high surrounding urban land cover (>50%), an increasing problem in the continually growing populace of Long Island (Koczek and Cohen 2013).

4. New York Species Demographics and Life History

- Breeder in New York**
 - Summer Resident**
 - Winter Resident**
 - Anadromous**
- Non-breeder in New York**
 - Summer Resident**
 - Winter Resident**
 - Catadromous**
- Migratory only**
- Unknown**

Species Demographics and Life History Discussion:

Much of the life history information available is for “sharp-tailed sparrow” or “saltmarsh sparrow” and does not distinguish between Nelson’s sparrow and saltmarsh sparrow. However, work done by Post and Greenlaw (1982) provides information specific to New York’s sharp-tailed sparrows, which are certainly *A. caudacutus*.

From Greenlaw and Rising (1994): Saltmarsh sparrows are nonterritorial and promiscuous. Both males and females breed at one year of age. Few data are available on annual or lifetime reproductive success. Females averaged 1.0 successful nests each year. Height of nests relative to spring high tides (especially new-moon peak tides) and timing of nest-starts in relation to spring tides significantly influenced nest success. The most successful nests were renestings that followed a spring new-moon high tide, which devastated earlier nests. In New York, mean nesting success was 46.9%. Corrected for exposure, the probability that a nest survived and produced fledglings in New York varied from 0.144 to 0.469 during 4-yr study period (Post and Greenlaw 1982). A recent study by Koczek and Cohen (2013) has noted even lower corrected nest success in 2012-2013 at

10.42% and 26.39% consecutively. Seasonal (annual) productivity (young/female/yr) varied from 2.65 (1980) to 5.25 (1978) in New York. Estimates of minimum annual survival of adults (based on cumulative returns) in 2 cohorts in New York were 60.3% and 54.7% in males, and 63.3% and 53.0% in females (Post and Greenlaw 1982); no difference detected between sexes. No information is available on lifetime reproductive success and how it varies among individuals in a population. Maximum observed longevity in New York: 10 yr in males (1 case out of 243 banded birds that returned), 6 yr (1/136) in females.

Natal philopatry is evident, and site fidelity is strongly and equally developed in males and females that have bred at least once.

DeRagon (1988) found that 63% of nest failures in a Rhode Island study were attributable to high spring tides, especially those occurring at the new moon. Flooding destroyed 91% of nests in another Rhode Island study (Diquinzio et al. 2002). Tidal flooding is also an important source of nest failure in New York, as is predation. Known predators include northern harrier, fish crow, red fox, raccoon, and garter snake.

5. Threats:

Any activities that would result in loss or degradation to saltmarsh habitat—ditching, dredging, and fragmenting—are threats to this species. Stedman and Dahl (2008) estimate the loss of almost 20,000 acres (0.9%) of saltwater wetlands along the Atlantic Coast from 1998 to 2004. Sea-level rise resulting from climate change is expected to have a significant impact on all coastal nesting species. An expected increase in the frequency and severity of coastal storms are also serious threats to reproductive success (Bayard and Elphick 2011).

This sparrow was classified as “moderately vulnerable” to predicted climate change in an assessment of vulnerability conducted by the New York Natural Heritage Program (Schlesinger et al. 2011). Bayard and Elphick (2011) investigated the frequency of tidal flooding and the response of females to these events, and concluded that saltmarsh sparrow are incredibly vulnerable to even slight increases in sea level.

Invasion of nonnative plant species including common reed (*Phragmites australis*) is also thought to degrade habitat (Benoit and Askins 1999). Predation and high tide flooding are known to be factors affecting reproductive success. There is potential for a negative effect from rising ocean levels, but this is speculative (Hodgman et al. 1998). Spraying for mosquito control may be a threat (Byrd and Johnston 1991).

Saltmarsh sparrow is endemic to the East Coast of the United States and persists in “a narrow ribbon” of disappearing coastal habitat. Populations are estimated to be around 250,000 birds. These two factors make the possibility of extirpation high.

Exposure to mercury is a threat to saltmarsh sparrows throughout the Northeast; high exposure may result in detrimental physiological and behavioral changes, including reduced reproductive success (Lane et al. 2011). In New York, mercury is a significant stressor for breeding saltmarsh sparrows and Long Island sparrows showed some of the highest blood mercury concentrations among study areas throughout the Northeast. At three of the seven New York marshes sampled, sparrows had blood mercury levels high enough to negatively impact reproductive success. Analysis of wing and tail feathers indicated that mercury exposure occurred on the breeding grounds (i.e., NY) rather than wintering grounds (NYSERDA 2012).

Are there regulatory mechanisms that protect the species or its habitat in New York?

No Unknown

Yes

This sparrow is protected by the Migratory Bird Treaty Act. The New York State Tidal Wetlands Act of 1973 protects saltmarsh habitat from being filled and developed.

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Continued protection of habitats is necessary. Because the threat to tidal wetlands is a significant concern for saltmarsh sparrow, habitat creation may become an important consideration in the near future. However, recent work suggests that many tidal marsh restoration sites have not been occupied by this species, despite the occurrence of other tidal marsh species (Bayard and Elphick 2011, Elphick et al. 2012) and that attracting saltmarsh sparrows to newly created or restored habitat using traditional methods (i.e., conspecific attraction) may not be possible (Bayard and Elphick 2012).

An analysis of the effectiveness of the New York Tidal Wetlands Act of 1974 was conducted by comparing aerial photos from 1974 and 1995. Freshwater wetlands were gained at both Shinnecock Bay (161 acres) and Moriches Bay (100 acres) during this period.

Burning is detrimental, as birds use dried grasses from the previous season for nesting (Greenlaw and Rising 1994). Because the presence of saltmarsh sparrows is negatively correlated with common reed, management of this invasive species may be beneficial (Benoit and Askins 1999).

Continued research and monitoring of mercury levels in breeding saltmarsh sparrows and their habitat and prey items is recommended because this species is an important bioindicator of mercury contamination in New England's coastal systems (Lane et al. 2011, NYSERDA 2012). Conservation actions following IUCN taxonomy are categorized in the table below.

Conservation Actions	
Action Category	Action
Land/Water Protection	Site/Area Protection
Land/Water Protection	Resource/Habitat Protection
Land/Water Management	Site/Area Management
Land/Water Management	Invasive/Problematic Species Control
Land/Water Management	Habitat/Natural Process Restoration
Law/Policy Actions	Legislation Change/Implementation- formal government sector legislation or policies at all levels
Law/Policy Actions	Legislation Change/Implementation- affecting implementation of laws at all levels
Livelihood/Economic/Other Incentives	Promote Alternative Products/Services
Livelihood/Economic/Other Incentives	Market Forces to Change Behaviors
Livelihood/Economic/Other Incentives	Conservation Payments to Change Behaviors
External Capacity Building	Institutional & Civil Society Development
External Capacity Building	Conservation Finance Raising/Providing Funds

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for salt marsh breeding birds, which includes saltmarsh sparrow.

Habitat Management:

- ___ Develop coordinated and specific habitat management and restoration projects for identified focus areas.
- ___ Integrate bird conservation interests in agency planning, management, research, restoration, and permitting actions, within the context of agency missions.
- ___ Protect extant salt marsh habitat through:

- Developing and implementing a salt marsh management and restoration plan.
- Mapping extant salt marshes in the Lower Hudson/Long Island Bays Watershed.
- Implementing a “no net increase” in shoreline armoring for all estuaries, bays, and harbors in the watershed.
- Protecting land and requiring upland buffers associated with salt marsh habitat.
- Establishing vegetated buffers landward of salt marshes.
- Protecting salt marsh platforms of shoals and flats created by temporary barrier island beaches and overwash fans.
- Modifying tidal wetland laws, regulations, and policies to address sea level rise.

Habitat Monitoring:

___ Regularly monitoring status and trends of salt marsh habitat through aerial surveys and site-based monitoring.

Habitat Research:

___ Identify strategies and develop a plan for slowing the loss of emergent tidal salt marsh to erosion, fragmentation, and invasive species.

Habitat Restoration:

___ Alternative methods of mosquito control should be investigated to allow the modification of mosquito ditching to restore native ecological habitats, by allowing vegetated tidal wetlands to take precedence over mosquito control efforts in some areas. Mosquito ditching should be removed/closed when possible.

___ Financial incentives for landowners to remove bulkheads and plant native vegetation in upland buffer area to protect salt marshes.

___ Work with State, Federal, Local, and NGOs to identify tidal wetlands and fund their restoration to intact emergent salt marsh. Develop coordinated and specific habitat restoration projects for identified focus areas.

___ Develop NYS guidelines for salt marsh restoration. The guidelines should include information on the following:

- Phragmites control
- Reconnecting disjunct or fragmented salt marshes
- Reducing nutrient loading into salt marshes from road run-off septic systems, fertilizers, etc.
- Naturalizing and softening the shoreline
- Natural and “soft” alternatives to bulkheads

Invasive Species Control:

___ Develop plan for addressing habitat loss to invasive Phragmites reed.

Life History Research:

___ Identify critical habitat components for supporting each species.

Population Monitoring:

___ Initiate statewide, comprehensive salt marsh-breeding bird survey for Seaside Sparrow, Salt Marsh Sharp-tailed Sparrow, Black Rail, and Clapper Rail. Resurvey active sites annually, and all habitat sites every 5 years. Continue annual tern surveys and gull surveys every three years as part of Long Island Colonial Waterbird Survey.

Statewide Baseline Survey:

___ Initiate statewide, comprehensive salt marsh-breeding bird survey for Seaside Sparrow, Salt marsh Sharp-tailed Sparrow, Black Rail, and Clapper Rail.

Statewide Management Plan:

___ Develop coordinated, statewide management plan that takes into consideration differences in habitat needs, species distribution, life histories, and human impacts.

References

AOU (American Ornithologists Union). 2009. Fiftieth supplement to the American Ornithologists Union Checklist of North American Birds. *Auk* 126(3):705-14.

Bayard, T. S. and C. S. Elphick. 2011. Planning for sea level rise: quantifying patterns of saltmarsh sparrow nest flooding under current sea level conditions. *Auk* 128:393-403.

Bayard, T. S. and C. S. Elphick. 2012. Testing for conspecific attraction in an obligate saltmarsh bird: can behavior be used to aid marsh restoration? *Wetlands* 32:521-529.

Benoit, L. K. and R. A. Askins. 2002. Relationship between habitat area and the distribution of tidal marsh birds. *The Wilson Bulletin* 114(3):314-23.

Byrd, M. A., and D. W. Johnston. 1991. Birds. Pages 477-537 in K. Terwilliger, coordinator. Virginia's endangered species: proceedings of a symposium. McDonald and Woodward Publ. Co., Blacksburg, Virginia.

- Cruickshank, A. D. 1942. Birds around New York City. American Mus. Nat. Hist. Handbook Series no. 13, New York.
- Dettmers, R. and K. V. Rosenberg. 2000. Partners in Flight bird conservation plan for southern New England (physiographic area 9). Version 1.0. American Bird Conservancy.
- DiQuinzio, D. A., P. W. C. Paton, and W. R. Eddleman. 2001. Site fidelity, philopatry, and survival of promiscuous Saltmarsh Sharp-tailed Sparrows in Rhode Island. *Auk* 118:888–899.
- DiQuinzio, D. A., P. W. C. Paton, and W. R. Eddleman. 2002. Nesting ecology of saltmarsh sharp-tailed sparrows in a tidally restricted salt marsh. *Wetlands* 22(1):179-85.
- DeRagon, W.R. 1988. Breeding ecology of seaside and sharp-tailed sparrows in Rhode Island salt marshes. M.S. thesis. University of Rhode Island, Kingston, Rhode Island.
- Elliott, J.J. 1953. The nesting sparrows of Long Island. *Long Island Naturalist* 2:15-24.
- Elliott, J. J. 1962. Sharp-tailed and Seaside sparrows on Long Island, New York. *Kingbird* 12:115-123.
- Elphick, C., S. Meiman, and M. Rubega. 2012. Abstract: Does tidal marsh restoration benefit globally vulnerable birds? North American Ornithological Conference, Vancouver, British Columbia.
- Greenlaw, J. S. 2008. Sharp-tailed Sparrow, *Ammodramus caudacutus*. Pages 560-561 in *The Second Atlas of Breeding Birds in New York* (K. J. McGowan and K. Corwin, eds.). Cornell University Press, Ithaca, NY.
- Greenlaw, J.S., and J.D. Rising. 1994. Sharp-tailed Sparrow (*Ammodramus caudacutus*). In A. Poole and F. Gill, editors, *The Birds of North America*, No. 112. Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington, DC. 28 pp.
- Hill, N.P. 1968. Eastern sharp-tailed sparrow in *Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies*, by A.C. Bent and collaborators., ed. O.L. Austin. U.S. National Museum Bulletin no. 237, part 2. Washington D.C. Pages 795-812.
- Hodgman, T. P., W. G. Shriver, and P. D. Vickery. 2002. Redefining range overlap between the sharp-tailed sparrows of coastal New England. *Wilson Bulletin* 114:38-43.
- Kocek, A. R. and J. B. Cohen, 2013. Saltmarsh sparrow nest success and nesting habitat preferences. Unpublished raw data.
- Lane, O.P., K.M. O'Brien, D.C. Evers, T.P. Hodgman, A. Major, N. Pau, M.J. Ducey, R. Taylor, and D. Perry. 2011. Mercury in breeding Saltmarsh Sparrows (*Ammodramus caudacutus*). *Ecotoxicology* 20:1984-1991.
- Lent, R.A. 1988. Sharp-tailed Sparrow, *Ammodramus caudacutus*. Pages 452-53 in *The Atlas of Breeding Birds in New York* (R.F. Andrle and J.R. Carroll, eds.). Cornell University Press, Ithaca, NY.

- NYSERDA (New York State Energy Research and Development Authority). 2012. Mercury assessment of saltmarsh sparrows on Long Island, NY, 2010-2011: Final report. Albany, NY.
- Pierson, E.C., J E. Pierson and P.D. Vickery. 1996. A Birders Guide to Maine. Down East Books, Camden, ME.
- Post, W. and J. S. Greenlaw. 1982. Comparative costs of promiscuity and monogamy: a test of reproductive effort theory. *Behav. Ecol. Sociobiol.* 10:101-107.
- Schiff, S. and A. Wollin. 1992. Region 10 – Marine. *Kingbird* 42:278-282.
- Schlesinger, M.D., J.D. Corser, K.A. Perkins, and E.L. White. 2011. Vulnerability of at-risk species to climate change in New York. New York Natural Heritage Program, Albany, NY.
- SHARP (Saltmarsh Habitat and Avian Research Program) 2011. The Conservation of Tidal Marsh Birds: Guiding action at the intersection of our changing land and seascapes. Compiled Overview Report for the 2011 Field Season. Available <http://www.tidalmarshbirds.org/wp/wp-content/uploads/downloads/2012/04/SHARP_overview_report_2011.pdf> (Accessed: 14 February. 2013).
- Stedman, S. and T.E. Dahl. 2008. Status and trends of wetlands in the coastal watersheds of the Eastern United States 1998 to 2004. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and U.S. Department of the Interior, U.S. Fish and Wildlife Service. 32 pages.
- Therres, G.D. 1999. Wildlife species of regional conservation concern in the northeastern United States. *Northeast Wildlife* 54:93-100.

Date last revised: December 2014